SYMPHURUS HERNANDEZI (PLEURONECTIFORMES: CYNOGLOSSIDAE), A NEW DEEP-WATER TONGUEFISH FROM THE SOUTHERN CARIBBEAN SEA OFF COLOMBIA

Lina M. Saavedra-Díaz, Thomas A. Munroe and Arturo Acero P.

ABSTRACT

A new cynoglossid species, *Symphurus hernandezi*, is described from 83 specimens (50.9–126.9 mm SL) taken on the outer continental shelf (82 specimens collected between 148 and 301 m) off Caribbean Colombia. This species is distinguished from all congeners by its unique purplish pigmentation and pepperdot pattern of melanophores on the blind side of the body. *Symphurus hernandezi* has a 1-3-2 pattern of interdigitation of dorsal-fin pterygiophores and neural spines, 12 caudal-fin rays and a black peritoneum. Among congeners, *S. hernandezi* is most similar to the sympatrically occurring *S. marginatus*, but is easily distinguished from that species by differences in ocular- and blind-side pigmentation patterns, fewer longitudinal and head scales (77–86 and 13–16 in *S. hernandezi* vs 86–99 and 16–20 in *S. marginatus*, respectively), and by several morphometric features including shorter dorsal- and anal-fin rays, deeper body depth in the caudal region, longer head and postorbital lengths, and a smaller pupil diameter. *Symphurus hernandezi* has a restricted distribution on the outer continental shelf off Caribbean Colombia.

Research on the fish communities of Colombian marine waters has primarily focused attention on fish assemblages occurring in shallow waters. The deep-water fish fauna off Colombia is poorly sampled and little known. A few exploratory cruises sampling deep sea fishes in Colombian waters were undertaken during the past century primarily by investigators from foreign countries. One of the first collecting expeditions to this region was the 1939 Allan Hancock Atlantic Expedition's R/V VELERO III, which collected deep sea fauna along the southern Caribbean shelf between Venezuela and Panama (Caldwell and Caldwell, 1964). Beginning in 1963, the National Marine Fisheries Service's R/V OREGON I and OREGON II made a series of exploratory cruises including stations on the outer continental shelf of the southern Caribbean (Bullis and Thompson, 1965). Much of the material collected during these cruises was deposited in U.S. collections, and has been included in numerous taxonomic works revising a variety of marine fishes. In 1966 and 1968, the University of Miami's R/V JOHN ELLIOT PILLSBURY conducted trawling in the Gulf of Venezuela and westward along the shelf to about Cartagena, Colombia. Several reports (Voss et al., 1967a,b; Voss, 1968; Bayer et al., 1970; Palacio, 1974) summarized material collected during these cruises. A recent collection of deep-sea fishes (to about 380 m) from the Colombian Caribbean region was made through an international collaborative effort of Colombian agencies and the Smithsonian's Tropical Research Institute in 1994. Identification of material taken during this series of deep-water trawls made along the Colombian continental shelf between the Gulf of Urabá and Islas del Rosario is ongoing.

To obtain more detailed knowledge concerning the biodiversity inhabiting the continental shelf and upper continental slope off Caribbean Colombia, Instituto de Investigaciones Marinas y Costeras (INVEMAR) conducted two cruises, INVEMAR-MACROFAUNA I and INVEMAR-MACROFAUNA II, between October 1998 and April

1999 (Saavedra Díaz et al., 2000) and during March 2001. Trawling stations during the cruises ranged in depth from 20–520 m. These INVEMAR Expeditions have collected many undescribed species and reports of first records of occurrence, either for the western Atlantic Ocean, the Caribbean Sea, Southern Caribbean or Colombian Caribbean, are in progress (Roa Varon et al., in press; Saavedra Díaz et al., unpubl. data). Among 210 fish species taken during the cruises, pleuronectiform species ranked third in numerical abundance and included ten species of tonguefishes (*Symphurus*: Cynoglossidae) (Saavedra Díaz et al., 2000; INVEMAR, unpubl. data). Of these, *S. marginatus* was the most abundant of four deep-sea tonguefishes collected. Also included among this material was an undescribed tonguefish species taken at stations located between 148 and 301 m. The purpose of this paper is to describe this species.

Methods

Specimens of *Symphurus* were captured by bottom trawl (16-m length, 7.7-m width, and 1-m height) during the Expedition INVEMAR-MACROFAUNA I and II cruises conducted along the Colombian continental shelf off marine eco-regions referred to as Guajira, Palomino, Tayrona, Magdalena, Morrosquillo and Darién (INVEMAR, 2000). Institutional abbreviations are as listed in Leviton et al. (1985).

Standard length (SL) is used throughout unless otherwise indicated. Counts follow those listed in Munroe (1998), and all, except scales, were obtained from radiographs. Specimens (n = 8) with two neural spines on the penultimate vertebra (usually 51, 52 or 53) were counted as having two vertebrae following the method of Munroe and Mahadeva (1989). Measurements follow those listed in Munroe (1998) except for: BD 80% SL– is the body depth measurement taken along a vertical line across the body at a point equal to 80% of the SL beginning from the snout; POL_2– a second postorbital length measured as a straight line between posterior margin of lower eye and posteriormost extent of lower opercular lobe; DFRL– length of longest dorsal-fin ray in anterior half of dorsal fin; AFRL– length of longest anal-fin ray in anterior half of anal fin; and PD– horizontal diameter of pupil of lower eye. Morphometric ratios are expressed in thousandths of SL or thousandths of HL. Descriptions of pigmentation features were based on freshly-caught specimens and material fixed in formalin and stored in 70% ethanol. Maturity was estimated by macroscopic examination of extent of posterior elongation of the ovaries (ovaries of mature females often conspicuous externally using light transmitted through specimen; developing ovaries of immature females best observed by dissection). Abbreviations are: ID pattern– interdigitation of anterior proximal dorsal pterygiophores and neural spines (after Munroe, 1992); BD– body depth; PDL– predorsal length; PAL– preanal length; CFL– caudal fin length; HL– head length; HW– head width; POL_1– postorbital length to posteriormost point on upper opercular lobe; SNL– snout length; UJL– upper jaw length; ED– eye diameter; UHL– upper head lobe width; LHL– lower head lobe width.

Results

Symphurus hernandezi new species
(Figs. 1–6; Tables 1,2)

Holotype.—INVEMAR-PEC 3751 (mature female, 85.9 mm), Colombia, Magdalena region off Bocas de Ceniza, 11°09′44″N, 74°40′00″W to 11°09′43″N, 74°39′40″W, 204 m, 2 Oct. 1998. Coll. L. Saavedra-Díaz, L.S. Mejía and G. Navas, bottom trawl, Sta. INV. 023 (E3), INVEMAR-MACROFAUNA I.

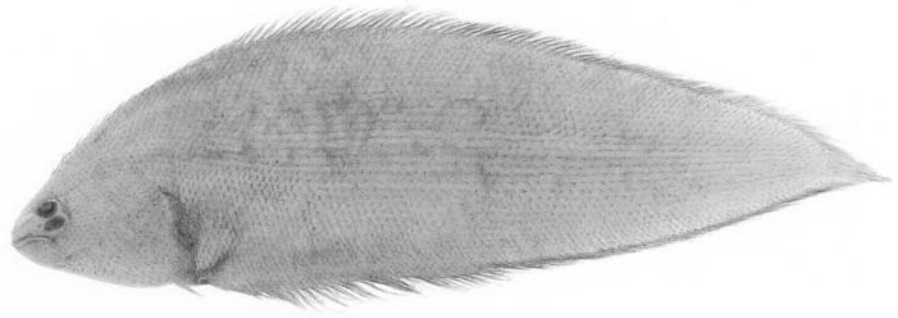

Figure 1. Ocular side of *Symphurus hernandezi*, holotype, INVEMAR-PEC 3751, 85.9 mm SL, captured on the outer continental shelf off Bocas de Ceniza, Caribbean Colombia.

Paratypes.—(Measured and counted 29 spec.; 50.9–96.5 mm, taken during INVEMAR-MACROFAUNA I cruise off Colombia). INVEMAR-PEC 3195 (2 females, 79.9, 83.5 mm), Magdalena region off Bocas de Ceniza, 11°09′44″N, 74°40′00″W to 11°09′43″N, 74°39′40″W, 204 m, 2 Oct. 1998, Sta. INV. 023 (E4). INVEMAR-PEC 3196 (female 96.5 mm), Tayrona region off Neguange, 11°24′42″N, 74°09′37″W to 11°24′53″N, 74°10′05″W, 301 m, 2 Dec. 1998, Sta. INV. 014 (E35). INVEMAR-PEC 3197 (male, 94.4 mm), Tayrona region off Neguange, 11°24′56″N, 74°12′48″W to 11°24′56″N, 74°12′25″W, 298 m, 2 Dec. 1998, Sta. INV. 015 (E38). INVEMAR-PEC 3756 (2 females and 2 males, 59.2–95.5 mm), same data as holotype. INVEMAR-PEC 3757 (female 55.7 mm, male, 81.9 mm), Magdalena region off Bocas de Ceniza, 11°09′44″N, 74°40′00″W to 11°09′43″N, 74°39′40″W, 204 m, 2 Oct. 1998, Sta. INV. 023 (E4). INVEMAR-PEC 3758 (2 females and 1 male, 68.5–88.3 mm), same data as holotype. USNM 368418 (3 females and 2 males, 58.5–93.9 mm), same data as holotype. UF 120607 (2 females, 80.9, 91.5 mm), same data as holotype. UF 120608 (2 females and 1 male, 56.5–80.8 mm), Magdalena region off Bocas de Ceniza, 11°9′44″N, 74°40′00″W to 11°9′43″N, 74°39′40″W, 204 m, 2 Oct. 1998, Sta. INV. 023 (E4). ICNMNH 6442 (2 females and 1 male, 50.9–94.1 mm), same data as holotype. ICNMNH 6443 (2 males and 1 female, 58.9–66.5 mm), Magdalena region off Bocas de Ceniza, 11°09′44″N, 74°40′00″W to 11°09′43″N, 74°39′40″W, 204 m, 2 Oct. 1998, Sta. INV. 023 (E4).

Non-Type Specimens.—(54 spec., 56.3–126.9 mm, off Colombia). INVEMAR-PEC 3192 (10 females and 8 males, 56.3–83.5 mm), same data as holotype. INVEMAR-PEC

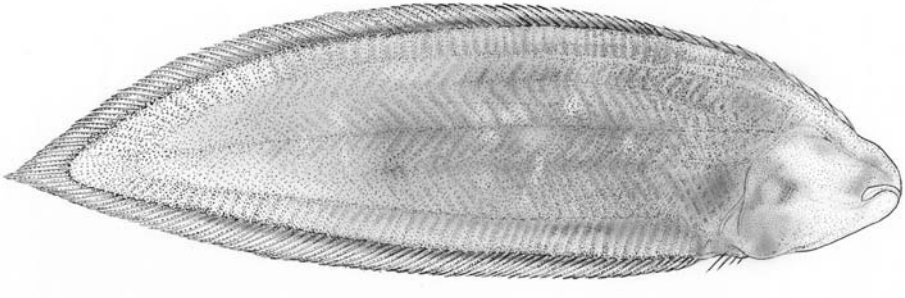

Figure 2. Purple pigmentation pattern (gray areas) overlaying pepperdot melanophores on blind side of preserved specimen of *Symphurus hernandezi* from the outer continental shelf off Colombia.

3193 (8 females and 3 males, 78.9–100.1 mm), same data as holotype. INVEMAR-PEC 3194 (8 females and 5 males, 56.5–92.6 mm), Magdalena region off Bocas de Ceniza, 11°09′44″N, 74°40′00″W to 11°09′43″N, 74°39′40″W, 204 m, 2 Oct. 1998, Sta. INV. 023 (E4), INVEMAR-MACROFAUNA I cruise. INVEMAR-PEC 3759 (5 males, 105.4–116.3 mm), Magdalena region off Bocas de Ceniza, 11°08′18″N, 74°53′49″W to 11°08′44″N, 74°53′41″W, 153 m, 21 Mar. 2001, Sta. INV. 063 (E132), INVEMAR-MACROFAUNA II cruise. INVEMAR-PEC 3760 (6 males, 114.3–126.9 mm), Magdalena region off Bocas de Ceniza, 11°03′39″N, 74°53′39″W to 11°08′06″N, 74°53′39″W, 148 m, 21 Mar. 2001, Sta. INV. 063 (E133), INVEMAR-MACROFAUNA II cruise. INVEMAR-PEC 3761 (male, 117.0 mm), Magdalena region off Morro Hermoso, 10°56′36″N, 75°06′29″W to 10°56′51″N, 75°06′07″W, 20.9 m, 22 Mar. 2001, Sta. INV. 064 (E134), INVEMAR-MACROFAUNA II cruise.

Diagnosis.— *Symphurus hernandezi* is the only Atlantic tonguefish featuring a combination of a 1-3-2 ID pattern, 12 caudal-fin rays, black peritoneum and the combination of dark, purplish coloration and pepperdot pattern of dark melanophores on the blind side of the head and body. *Symphurus hernandezi* is further distinguished from all congeners by combination of: 9(6+3) abdominal vertebrae; 51–54 total vertebrae; 5, or less frequently 4, hypurals; 95–102 dorsal-fin rays; 80–86 anal-fin rays; approximately 77–86 scales in longitudinal series; absence of pupillary operculum; eyes contiguous or nearly contiguous; teeth present on entire margin of ocular-side jaws; absence of fleshy ridge on ocular-side lower jaw; and absence of scales on blind sides of dorsal- and anal-fin rays. Among congeners, the new species is similar in most counts and overall body shape to *S. marginatus,* a sympatric species also occurring on the continental shelf off Caribbean Colombia, but differs in its pigmentation (blind-side unpigmented in *S. marginatus*), scale counts and several morphometric features.

Description.— Meristic features are presented in Table 1. *Symphurus hernandezi* is a medium-sized species, reaching to about 127 mm SL. ID pattern usually 1-3-2 (62/71 individuals), less frequently 1-2-2, 1-2-3, 1-3-1, 1-3-3 or 1-4-1. Caudal-fin rays 12 (62/68), rarely 10, 11 or 13. Dorsal-fin rays 95–102, usually 97–99. Anal-fin rays 80–86, usually 83–86. Pelvic fin with 4 rays. Anal-fin origin usually at a point between verticals through anterior and posterior margins of anus. Total vertebrae 51–54, usually 52–53 (66/71), abdominal vertebrae 9 (6+3). Hypurals 5, rarely 4. Longitudinal scale rows 77–86, usually 81–85 (most specimens missing scales, counts made primarily of scale pockets on ocular side). Scale rows on head between lower orbit and posterior opercular margin 13–16, usually 15 or 16.

Proportions of morphometric features presented in Table 2. Body depth greatest at point between opercular margin and body mid-point, BD 229–300 SL (mean 272.9); body with pronounced anterior curvature and gradual posterior taper; BD 80% SL 1.41–1.96 times in greatest BD (mean 1.58). Preanal length (PAL) usually smaller than body depth. Head usually longer than wide (19/30 individuals); HW/HL = 0.78–1.13 (mean 0.97). Postorbital head lengths usually similar; POL_1 = 577–680 HL, POL_2 = 554–718 HL. Lower head lobe slightly larger than upper head lobe (LHL/UHL = 0.95–1.30). Snout short, 165–208 HL (mean 183), covered with small ctenoid scales. Dermal papillae not evident anywhere on blind-side head. Ocular-side anterior nostril when depressed posteriorly usually reaching anterior margin of lower eye. Mouth large, 209–266 HL (mean 229.4); posterior margin of maxilla usually reaching to vertical through anterior third of lower eye. Eyes contiguous, or nearly so; lower eye large, 106–159 HL (mean 136.9);

Table 1. Summary of selected meristic features for 71 specimens of *Symphurus hernandezi* collected on the outer continental shelf off Caribbean Colombia. (Asterisks indicate values for holotype).

	Dorsal-fin rays									
	95	96	97	98*	99	100	101	102		
Frequency	2	7	11	20	23	6		1		
	Anal-fin rays									
	80	81	82	83	84*	85	86			
Frequency	1	1	5	16	32	14	2			
	Caudal-fin rays									
	10	11	12*	13						
Frequency	1	4	62	1						
	Total vertebrae									
	51	52*	53	54						
Frequency	3	32	34	2						
	Longitudinal scale rows									
	77	78	79	80	81	82*	83	84	85	86
Frequency	1	4	2	5	13	14	10	7	11	4
	Head scale rows									
	13	14*	15	16						
Frequency	2	13	24	25						
	ID pattern									
	1-2-2	1-2-3	1-3-1	1-3-2*	1-3-3	1-4-1				
Frequency	1	2	2	62	3	1				

smaller specimens with upper eye smaller than lower, larger specimens with upper eye slightly larger than lower. Interorbital space narrow or absent. Pupillary operculum absent. Pupil diameter (PD) small (56–80 HL, mean 69.8). Dorsal-fin origin usually at vertical through posterior margin of upper eye; predorsal length 292–392 HL (mean 335). Dorsal- and anal-fin rays short, DFRL = 256–412 HL (mean 339.3), AFRL = 235–425 HL (mean 344.2). Blind sides of dorsal- and anal-fin rays without scales. Teeth present on all jaws. Blind-side dentary with 4–6 rows of strong teeth on entire jaw; tooth bands narrowing and crowded on anterior fifth of jaw; blind-side premaxilla with crescentic tooth band consisting of 4–6 rows of teeth on posterior and middle of jaw, narrowing to only 2–3 tooth rows on anterior fifth of jaw. Ocular-side premaxilla and dentary usually with single row of teeth extending along posterior 3/4ths of jaw. Scales large, ctenoid on both sides of body; ocular-side scales slightly larger than those of blind side.

Pigmentation—(Based on preserved material).—(Figs. 1,2). No conspicuous differences in pigmentation were observed between males and females. Ocular-side background pigmentation on head and body uniformly medium brown with margins of scale pockets deeply pigmented and dark. Caudal blotch (when present) small, diffuse and faint, without well-defined borders, on posterior 1/4 of body (most obvious in specimens retaining scales). Peritoneal region and ocular-side opercle with darker, bluish-black color than general body surface. Inner opercular linings on both sides covered with conspicuous dark melanophores showing through to outer opercular surfaces. Varying portions of blind-side body and head uniformly dark purple (Fig. 2); some specimens with nearly 70% of blind-side purplish, others with numerous purple marks separated by unpigmented areas extending from head region posteriorly and best developed in anterior 1/2 to anterior 3/4

Table 2. Summary of morphometrics for holotype (INVEMAR-PEC 3751) and 29 paratypes of *Symphurus hernandezi* collected on the outer continental shelf off Caribbean Colombia. Characters 2–17 expressed in thousandths of Standard Length; 18–28 expressed in thousandths of Head Length (Abbreviations defined in methods; SL in mm).

Character	Holotype	Paratypes		
		Range	Mean	SD
1. SL	85.9	50.9–96.5	75.6	13.83
2. BD	289	229–300	272.9	13.82
3. BD (80%SL)	190	132–198	173.3	15.74
4. PDL	68	61–83	70.3	5.19
5. PAL	248	189–258	242.6	15.35
6. CFL	83	44–106	76.7	16.66
7. HL	216	194–219	209.9	5.92
8. HW	229	166–229	203.1	13.92
9. POL 1	136	116–145	129.4	5.63
10. POL 2	136	108–146	127.6	8.92
11. SNL	40	32–44	38.7	3.35
12. UJL	51	42–54	48.4	2.87
13. ED	28	23–34	28.8	2.71
14. UHL	123	87–123	102.4	9.28
15. LHL	125	90–126	111.8	7.30
16. DFRL	76	53–88	71.4	9.95
17. AFRL	81	49–93	72.4	10.62
18. POL 1	629	577–680	615.7	21.03
19. POL 2	629	554–718	607.1	39.24
20. SNL	188	165–208	183.3	14.21
21. PD	61	56–80	69.8	6.59
22. ED	132	106–159	136.9	12.43
23. UHL	569	420–586	488.3	47.50
24. LHL	580	436–646	532.6	39.32
25. PDL	317	292–392	335.0	22.88
26. UJL	236	209–266	229.4	11.56
27. DFRL	354	256–412	339.3	48.04
28. AFRL	376	235–425	344.2	50.29

of body; blind side also with variable amounts of pepperdot melanophores usually dispersed across entire surface, but especially dense and darkly pigmented in dermis beneath body regions with purplish coloration; dermal melanophores also dense and outlining myotomal septa, and dense in blind-side dermal areas between proximal pterygiophores of dorsal and anal fins; peritoneum bluish-black, conspicuously evident through skin on both sides of body. Dorsal and anal fins generally purplish-black without any posterior

intensification; under magnification interradial membranes and skin covering finrays light purple with conspicuous dark melanophores. Ocular-side lips black; blind-side lips unpigmented.

Pigmentation—(Based on freshly-caught specimen).—Ocular-side head and body with medium brown background coloration. Caudal blotch small and diffuse, without well-defined borders. Operculum and peritoneal region dark bluish-black. Dorsal and anal fins bluish-purple throughout length of fins, with pigmentation more intense along basal margins. Caudal fin light brown basally, with darker brown medial band, and with distal region bluish-purple. Blind-side head and anterior 2/3 of body with dense pattern of conspicuous pepperdot melanophores and with intense metallic blue pigment. Pepperdots especially dense in regions underlying bluish pigment. Posterior 1/3 of body medium brown with less densely concentrated pepperdots and lacking bluish pigment. Skin overlying hypural region with small patch of bluish-purple pigment. Blind-side lips white.

Size and Sexual Maturity.— (Fig. 3). 72 specimens measured ranged in size from 50.9–100.1 mm. The largest *S. hernandezi* examined in this study is a female of 100.1 mm; the largest male measures 95.5 mm. Of specimens examined, 29 are males (50.9–95.5 mm) and 43 females (55.7–100.1 mm), 16 immature (55.7–79.9 mm) and 23 mature (71.9–100.1 mm). Additional specimens collected in INVEMAR-MACROFAUNA II ranged to nearly 127 mm SL.

Etymology.— Named in honor of Dr. Jorge ("Mono") Hernández-Camacho, respected Colombian scientist and talented naturalist, who died on September 15, 2001. Known for his generosity and wisdom, extensive knowledge of biodiversity, and his willingness to share his time, energy and information with students. His spirit will live on in the minds and hearts of Colombian biologists who were fortunate enough to know him.

Geographic and Bathymetric Distribution.— *Symphurus hernandezi* apparently is endemic on the outer continental shelf off the Caribbean coast of Colombia (Fig. 4). Of 170 trawl stations made on the outer shelf between 200 and 520 m, *S. hernandezi* was collected at only seven stations in a relatively narrow depth range (148–301 m) located off Bocas de Ceniza in Magdalena region and Parque Nacional Natural Tayrona in Tayrona region. Of 83 specimens collected during both INVEMAR cruises, 82 were collected between 148 and 301 m. A single specimen, collected at a reported depth of 20.9 m, and the only capture of this species beyond the Magdalena-Tayrona region, is an unusually shallow collection based on depth of capture information recorded for other specimens. This specimen was purportedly collected at Sta. INV. 064; however, this station immediately followed a deepwater station (INV. 063) made at 153 m off Bocas de Ceniza, where five specimens of *S. hernandezi* were captured. Although we can not be certain, the location and shallow depth of capture recorded for this specimen appear anomalous. Oftentimes, due to morphology and size, *Symphurus* specimens remain enmeshed in trawl nets until manually removed or physically dislodged during subsequent trawls. We think it is likely that the specimen reported from INV. 064 was actually captured at INV. 063, but not discovered in the net until Sta. INV. 064.

Comparisons.—*Symphurus hernandezi* differs from all other *Symphurus* by its distinctive pigmentation pattern, especially in features of its blind-side coloration. *Symphurus hernandezi* is the 10th species known from the western Atlantic featuring the combination of a predominant 1-3-2 ID pattern and 12 caudal-fin rays, and is the 8th of these species also possessing a black peritoneum. Of all western Atlantic species (Munroe, 1998), *S. hernandezi* is most similar to *S. marginatus* in overall appearance and most meristic fea-

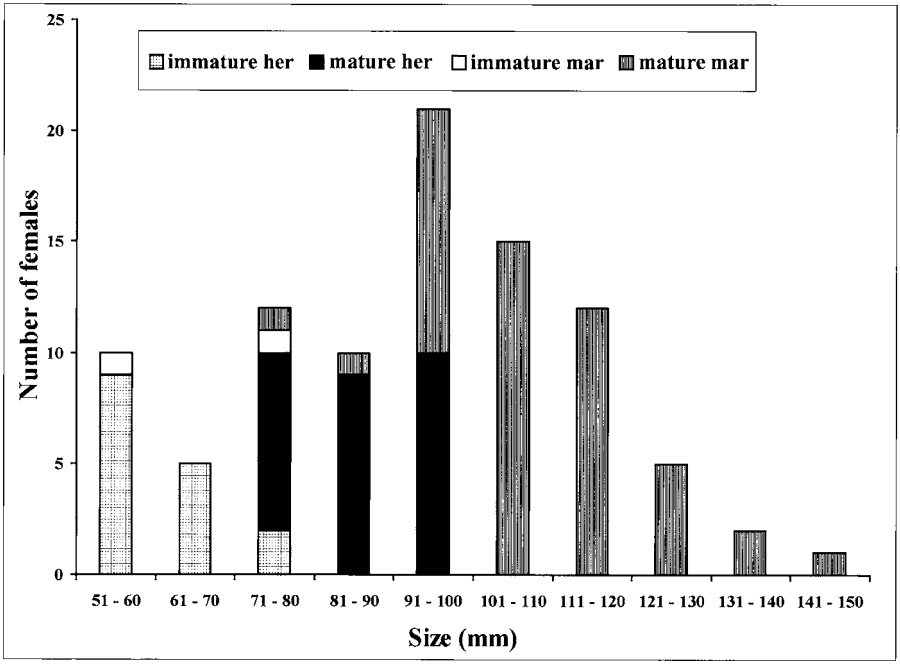

Figure 3. Frequency histogram indicating relative sizes (mm SL) of immature and mature females for *Symphurus hernandezi* (her) captured off Colombia and *S. marginatus* (mar) from throughout the range of the species (data from Munroe, 1998).

tures, except scale counts (77–86 longitudinal scale rows in *S. hernandezi* vs. 86–99 in *S. marginatus,* and 13–16 head scale rows vs. 16–20). These two species differ distinctively in various aspects of their pigmentation and morphology (Figs. 5,6), and *S. hernandezi* is a smaller species overall (Fig. 3). The most distinctive difference in coloration between these two species occurs in the pigmentation on the blind-side head and body. *Symphurus hernandezi* features conspicuous purple coloration and pepperdots on its blind side, whereas *S. marginatus* has a uniformly off-white or yellowish blind side. The dorsal and anal fins are also pigmented differently. In *S. hernandezi*, the ocular-side dorsal and anal fins on the caudal one-fifth of the body are pigmented more or less the same as those on the rest of the body. In *S. marginatus*, pigmentation on the ocular-side fins in the caudal one-fifth of the body intensifies and is distinctly darker (sometimes nearly black) compared with that in more anterior regions of these fins. Also, basal regions on the dorsal and anal fins of *S. hernandezi* are distinctly spotted with dark melanophores, whereas those of *S. marginatus* lack these distinctive melanophores, but instead have a more uniformly-pigmented dark band along their fin bases.

Although these two species share many similar morphological features, several morphometric characters are useful in differentiating them (Figs. 5,6). *Symphurus hernandezi* differs from *S. marginatus* in having a more gradual posterior taper reflected by its larger BD 80% SL for a given size (Fig. 5A); its longer head (HL 194–219 SL, mean 209.9) compared with that (Fig. 5B) of *S. marginatus* (HL 173–218, mean 188.0), and this species also has a longer postorbital length (POL_1) compared with that of *S. marginatus* (Fig. 5C). *Symphurus hernandezi* has conspicuously shorter dorsal- and anal-fin rays (DFRL

Figure 4. Capture locations of *Symphurus hernandezi* and *S. marginatus* off Caribbean Colombia (based on material examined). Sub-division of coastal areas into marine eco-regions follows that of INVEMAR (2000).

53–88 SL (mean 71.4) in *S. hernandezi* vs. 77–120 SL (mean 97.3) in *S. marginatus*; AFRL 49–93 SL (mean 72.4) vs. 73–121 SL (mean 99.0) in *S. marginatus*. *Symphurus hernandezi* has a smaller pupil diameter (PD 56–80 HL, mean 69.8) than that of *S. marginatus* (PD 65–99 HL, mean 82.5), possibly related to the fact that adults of these species occupy different habitats with respect to depth (usually 148–301 m for *S. hernandezi* vs. 284–750 m for *S. marginatus*, see Ecological Observations below), and in turn, light levels. These two species differ also in shape of their ocular-side opercles. Generally, in *S. hernandezi* both POL measurements are nearly equal indicating that both opercular lobes project posteriorly about the same distance behind the eyes and the lobes are equally developed and of nearly similar width. In *S. marginatus*, POL_2 is usually slightly longer than POL_1 reflecting the fact that the lower opercular lobe is longer and extends more posteriorly than does the upper. The lower opercular lobe of *S. marginatus* is usually also wider than the upper lobe.

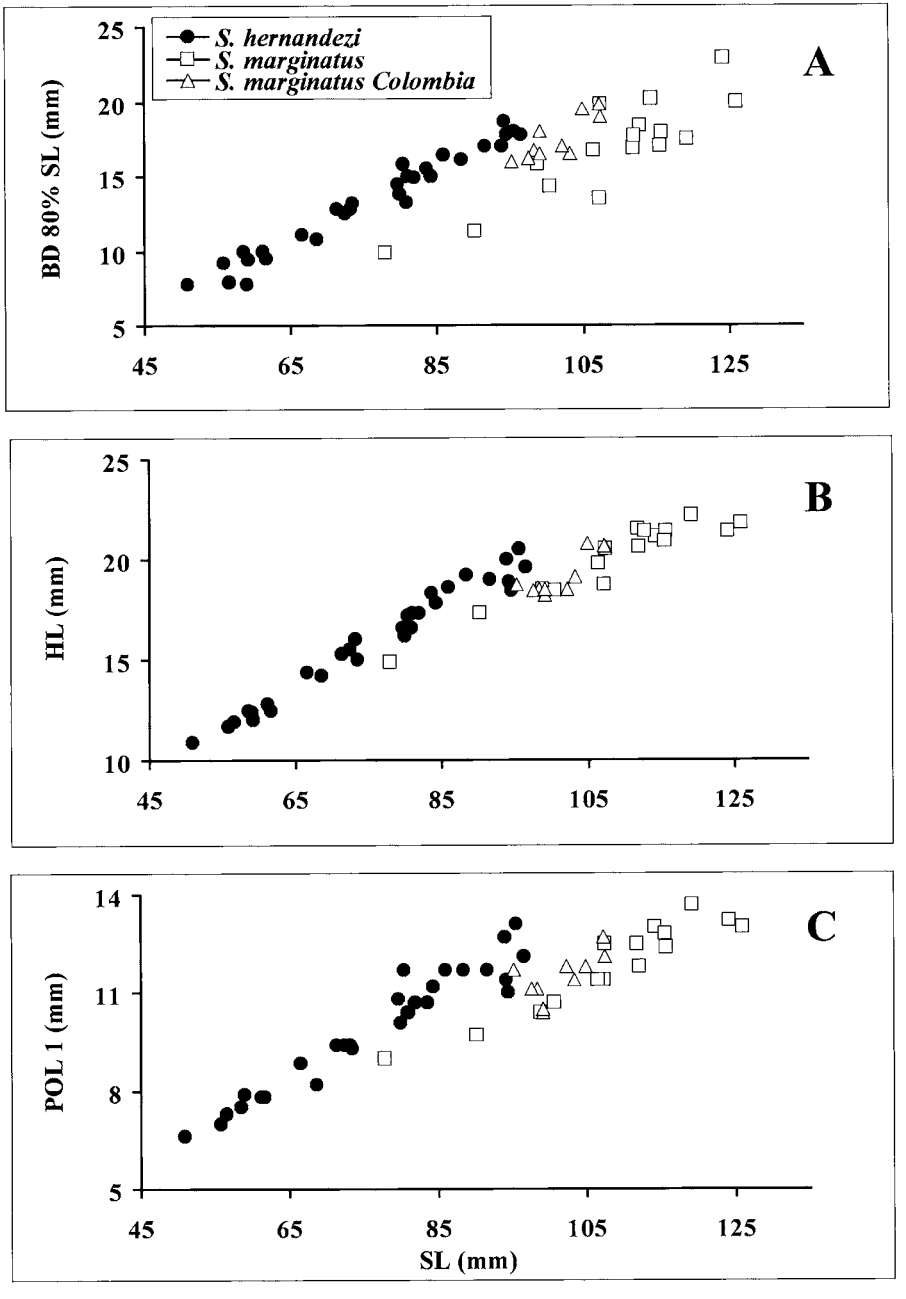

Figure 5. Comparison of selected morphometric features (in mm) for *Symphurus hernandezi* collected on the outer continental shelf off Caribbean Colombia and the sympatrically-occurring *S. marginatus*. Data for *S. marginatus* are presented for both individuals from throughout the geographic range of the species and separately for specimens collected off Colombia. (A) Body depth at 80% SL vs standard length. (B) Head length vs standard length. (C) POL_1 vs standard length.

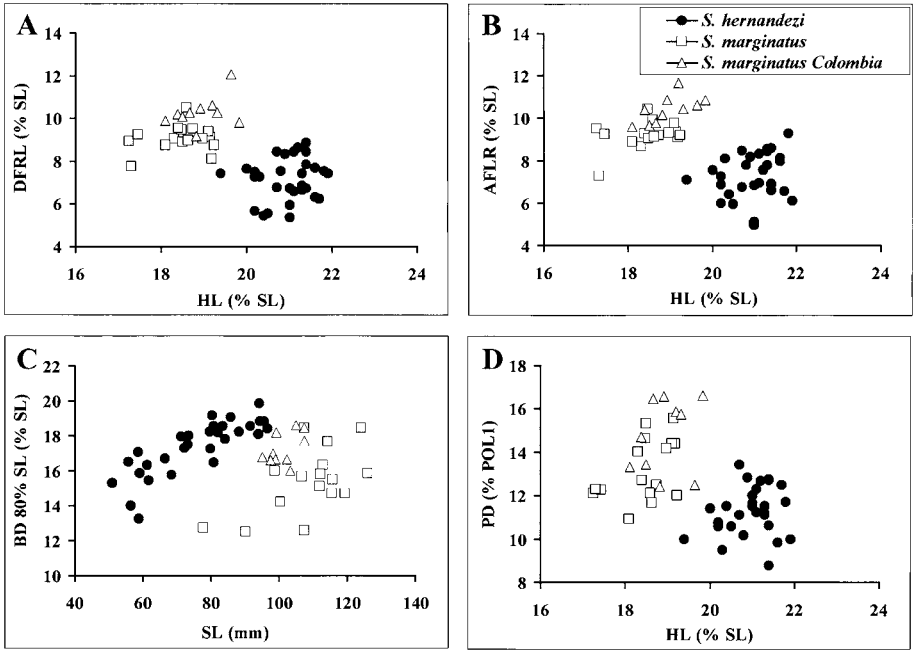

Figure 6. Comparison of selected diagnostic features for *Symphurus hernandezi* collected on the outer continental shelf off Caribbean Colombia and the sympatrically-occurring *S. marginatus*. Data for *S. marginatus* are presented for both individuals from throughout the geographic range of the species and separately for specimens collected off Colombia. (A) Length of longest dorsal fin ray vs head length (both as % SL). (B) Length of longest anal-fin ray vs head length (both as % SL). (C) Body depth at 80% SL (as % SL) vs standard length (mm). (D) Pupil diameter (as % POL_1) vs head length (as % SL).

Although *S. hernandezi* and *S. marginatus* are readily distinguished by pigmentation features, given their overall similarity in body shape, meristic features and deepwater habitats, they might be confused, especially either when specimens have lost pigmentation completely, or when pigmentation has faded over time in preservatives. However, by plotting various combinations of morphometric characters (Fig. 6A–D), the subtle but distinct morphological differences between these species can be highlighted to demonstrate several features helpful in diagnosing and identifying these species. For example, when ratios of dorsal- and anal-fin ray lengths are plotted against HL (both expressed in SL), the shorter finrays of *S. hernandezi* are clearly distinct (Fig. 6A,B). Likewise, when comparing relative rates of posterior tapering of the body plotted against SL (Fig. 6C), the more gradual taper of *S. hernandezi* (evidenced in BD 80% SL measurement) is readily apparent. Additionally, plotting ratios of pupil diameters (expressed in POL_1) against HL (in SL) for the two species (Fig. 6D) clearly separates *S. hernandezi* (with a smaller pupil) from *S. marginatus*.

Symphurus diabolicus and *S. microlepis*, deepwater species from the eastern Pacific (Munroe and McCosker, 2001), have the same ID-pattern and caudal-fin-ray count, and similar elongate shapes, as those of *S. hernandezi*. They differ from *S. hernandezi* in their pigmentation patterns (especially in having blind sides uniformly whitish or yellowish without purple color or pepperdots), in having non-overlapping dorsal-fin ray (106–110)

and anal-fin-ray counts (89–96), total vertebrae (57–59) and much higher longitudinal scale counts (118–135 vs 77–89 in *S. hernandezi*).

Some similarities exist between *S. hernandezi* and the eastern Atlantic *S. normani*, which also has pepperdot pigmentation on its blind side (Munroe, 1990). Similarities in this aspect of their pigmentation and in their caudal-fin-ray counts are the only ones between these two otherwise distinctive species. *Symphurus hernandezi* has a 1-3-2 ID pattern and a much more intensely-pigmented blind side with regard to both the pattern of melanophores and dark purple pigmentation on the head and body. Counts of *S. normani* for dorsal- (87–92) and anal-fin rays (72–77) and total vertebrae (48–50) are lower and do not overlap those of *S. hernandezi*. The longitudinal scale counts (95–105 vs 77–89 in *S. hernandezi*) are also non-overlapping and much higher in *S. normani*.

Other western Atlantic species (*S. pelicanus*, *S. piger*, *S. billykrietei*, *S. stigmosus* and *S. ginsburgi*) and the eastern Pacific *S. gorgonae* are similar to *S. hernandezi* in that they possess a 1-3-2 ID pattern, 12 caudal-fin rays and a black peritoneum. *Symphurus pelicanus* and *S. gorgonae* also have a pepperdot pattern on their blind sides, but lack the dark purple coloration of *S. hernandezi*. These species also have lower, and non-overlapping, meristic features (77–89 dorsal-fin rays, 64–74 anal-fin rays, 43–49 total vertebrae). *Symphurus hernandezi* differs from *S. piger* in its blind-side coloration (uniformy yellowish white without pepperdots in *S. piger*), its shallower body (BD 244–350 SL in *S. piger*) and higher, non-overlapping fin-ray counts (dorsal-fin rays 90 or less and anal-fin rays 74 or less in *S. piger*) and number of total vertebrae (49 or less in *S. piger* vs 51–54 in *S. hernandezi*).

Symphurus hernandezi differs more conspicuously from *S. billykrietei, S. stigmosus* and *S. ginsburgi*, all of which are deepwater western Atlantic species (Munroe, 1998), in features of its pigmentation (blind-side pigmentation of these other species without dark purple coloration and pepperdots; ocular-side of *S. billykrietei* and *S. ginsburgi* with distinct dark-brown crossbands vs no crossbands in *S. hernandezi*; *S. stigmosus* with series of alternating pigment blotches and unpigmented areas on dorsal and anal fins that are lacking in *S. hernandezi*) and in its higher, mostly non-overlapping dorsal-fin-ray counts (95–102 dorsal-fin rays in *S. hernandezi* vs 87–95 in these other species).

Remarks.— Evident from radiographs was that 9/71 specimens had two neural spines (one is the usual condition) on at least one vertebra. Eight of these specimens had two neural spines on the preural centrum, a condition typical for *Symphurus* species (Munroe and Mahadeva, 1989), and flatfishes in general (Rosen, 1973). One specimen was unusual in having double neural spines on vertebrae 33, 47 and 49.

Ecological Observations.— *Symphurus hernandezi* was one of ten species of *Symphurus* taken during the INVEMAR cruises, but only once during 170 trawls was *S. hernandezi* collected in the same trawl with another tonguefish (*S. marginatus* at Sta. INV. 014). The *S. hernandezi* population appears to be spatially separated from that of *S. marginatus* and other tonguefishes taken in this region with respect to geographic location and depth of occurrence. During the two cruises, 85 stations were occupied, but *S. hernandezi* were collected only at five of these stations, all located off the Magdalena-Tayrona region. Eighty-two specimens of *S. hernandezi* were taken in 9/22 trawls made in this region over a depth range of 148–301 m (mean depth of capture for 82 specimens = 229 m). About 84% (70/83) of the *S. hernandezi* taken during the study were collected in just two trawls made at Sta. INV. 023. This species did not appear in any trawls made at these depths beyond the Magdalena-Tayrona region. In contrast, of the 232 *S. marginatus* taken

during the cruises, nearly all (210/232) were taken at locations (Guajira, Palomino) different from those where *S. hernandezi* were captured. Although *S. marginatus* was collected in 25 trawls at 13 different stations during the cruises, only 4/232 specimens were taken at the same station, but not in the same trawl, where *S. hernandezi* were collected. In addition to occupying different geographic locations, the *S. marginatus* population also inhabits a different bathymetric region than does the *S. hernandezi* population. Specimens of *S. marginatus* taken during the cruises were captured between 299 and 504 m (mean depth of capture = 463 m) and throughout the species range reported depth of capture (284–750 m, mean depth 436 m; n = 102 specimens; Munroe 1998) is greater than that inhabited by *S. hernandezi*.

Trawls containing *S. hernandezi* were taken on bottoms with different sediment compositions. That off Bocas de Ceniza, where most of the specimens were taken, consists predominantly of sand, whereas the bottom off Parque Natural Nacional Tayrona is primarily rocky. *Symphurus hernandezi* probably feeds on a variety of benthic invertebrates. Thirty-three of 72 specimens radiographed contained both gastropod and bivalves in their digestive tracts.

Discussion

The Santa Marta region in the southern Caribbean Sea is a unique, geologically complex area featuring a very narrow continental shelf, nearly absent in many places, and highly heterogeneous marine environments. Inventories of both shallow- and deep-water fishes (Acero and Garzón, 1986; Santos-Martínez and Acero, 1991; Saavedra-Díaz, 2000), mollusks (Cosel, 1983) and sponges (Zea, 1987) have recorded a high diversity of species inhabiting this region. Of special interest is the occurrence of shallow- and deep-water endemic species or subspecies from unrelated taxa, including a variety of shallow-water organisms such as fishes, *Priolepis robinsi* (Gobiidae), *Emblemariopsis* new sp. (Chaenopsidae), *Diplobatis pictus colombiensis* Fechhelm and McEachran, 1984 (Narcinidae), the mollusk *Pachybetron tayrona*, and the alga *Cladophyllum schnetteri*. Deep-water endemic species include a mollusk, *Armina* new species Ardila and Díaz (in press), corals *Tethocyathus prahli* Lattig and Cairns (2000), crabs (*Cymonomoides fitoi* Lemaitre and Bermúdez, 2000; *Pyromaia acanthina* Lemaitre et al., 2001), and fishes. Mok et al. (2001) recently described two hagfish species (*Eptatretus wayuu* and *Quadratus ancon*) known only from the outer continental shelf off Caribbean Colombia, and during the INVEMAR cruises, new species of an octocoral and a solitary coral, both collected in the same trawls as *S. hernandezi*, were also discovered. The occurrence here on the outer shelf of endemic taxa, including the new tonguefish and hagfishes, points to the possibility of a unique evolutionary history for this continental shelf region that merits further investigation.

Additional comparative material. *Symphurus marginatus.* Measured and counted ten spec., 95.2 107.3 mm, taken during INVEMAR-MACROFAUNA I cruise off Colombia. INVEMAR-PEC 3207 (female, 102.2 mm), off Bahía Portete, 12°29′13.8″N, 72°15′29.4″W and 12°29′01.8″N, 72°15′51″W, 442 m, 22 Nov. 1998, Sta. INV. 003 (E14). INVEMAR-PEC 3208 (6 females and 2 males, 95.2 107.3 mm), Guajira region off Bahía Portete, 12°29′13.8″N, 72°15′29.4″W and 12°29′01.8″N, 72°15′51″W, 442 m, 22 Nov. 1998, Sta. INV. 003 (E14). INVEMAR-PEC 3213 (female, 99.0 mm), Guajira region off Punta Gallina, 12°31′47.4″N, 72°07′45″W and 12°31′28″N, 72°08′09″W, 451 m, 21 Nov.

1998, Sta. INV. 002 (E12). Meristic data taken from specimens of *S. marginatus* in Munroe (1998). Measured and counted 15 spec., (77.5 126.1 mm). USNM 315614, (126.1 mm), New Jersey, 39°11′N, 72°27′W, 330 m, 19 Aug 1974. USNM 291315, (2 spec., 111.6, 112.9 mm), Florida, 29°39′N, 80°11′W, 348 m, 10 Feb 1965. USNM 236609, (2 spec., 106.8, 114.7 mm), 29°39′N, 80°11′W, 348 m, 10 Feb 1965. USNM 236603, (107.4 mm), 29°14′N, 80°05′W, 357 m, 29 Nov 1965. USNM 291287, (100.4 mm), 29°03′N, 80°00′W, 348 m, 10 Feb 1965. USNM 291036, (2 spec., 77.5, 90.7 mm), 24°27′N, 83°32′W, 512 m, 26 Nov 1965. USNM 291037, (100.5 mm), 29°12′N, 87°46′W, 686 m, 3 Oct 1971. USNM 186042, (2 spec., 116.3, 118.6 mm), Alabama, 29°05′N, 88°22′W, 458 m, 12 Jun 1959. USNM 291314, (114.5 mm), Colombia, 12°30′N, 72°08′W, 470 m, 10 Oct 1965. USNM 159236, (107.7 mm), French Guiana, 7°12′N, 53°11′W, 329 m, 9 Nov 1957. USNM 159607, (122.8 mm), Suriname, 7°36′N, 54°42′W, 412 m, 7 Nov 1957.

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ADDRESSES: (L.M.S.) *Cerro de Punta Betín, Instituto de Investigaciones Marinas y Costeras INVEMAR, A.A. 1016, Santa Marta, Colombia*. *E-mail*: <*linasaavedra@eudoramail.com*>. (T.A.M.) *National Marine Fisheries Service National Systematics Laboratory, Smithsonian Institution, PO Box 37012, National Museum of Natural History, WC 57, MRC-153, Washington, DC 20013-7012. E-mail:* <*munroe.thomas@nmnh.si.edu*>. (A.A.P) *Universidad Nacional de Colombia, Instituto de Ciencias Naturales, Cerro de Punta de Betín, Apartado 1016 (INVEMAR), Santa Marta, Colombia. E-mail:* <*aacero@invemar.org.co*>.